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HEIGHT AND TIME DEPENDENCE OF THE DYNAMICS OF THE MID - LATITUDE UPPER MESOSPHERE-LOWER THERMOSPHERE DEDUCED FROM RADIOMETEOR MEASUREMENTS IN KAZAN (56°N, 49°E) DURING 1986-1995

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ABSTRACT

A homogeneous series of radiometeor observations in the height interval of 80-110 km obtained during 1986-1995 at the Eastern European mid-latitude station of - Kazan (56°N, 49°E) has been used to determine the height structure of parameters of prevailing and tidal movements of the zonal and meridional circulation, their inter-annual, annual, semi-annual oscillations and several-year averages; height and seasonal structures of wave disturbances of prevailing circulation with time scales of planetary waves; investment of long-period internal gravity waves in prevailing circulation was evaluated. The influence of solar cycle activity on dynamics has also been determined.

METHOD OF MEASUREMENTS AND PROCESSING OF DATA

Regular observations of the wind profile in the upper mesosphere - lower thermosphere are conducted at Kazan State University (56°N, 49°E) using the method of meteor track location. The main technical characteristics of the meteor radar (Sidorov and Fahrutdinova, 1991) are: carrier frequency 32 MHz, pulse duration 100 μs, pulse-repetition frequency 400 Hz, transmitted pulse power ~ 120 kW; baselines of phase interferometer, equal to 4λ and 4.5λ, oriented along the North-South and the East-West directions; root-mean-square error in height is 1 km.

Using the method of harmonic decomposition of the time series we have derived the prevailing zonal and meridional wind, amplitude and phase of the diurnal, semi-diurnal and 8-hourly tidal wind, as well as amplitude and phase of annual, semi-annual oscillations and mean-annual values of prevailing and tidal winds.

HEIGHT-TIME STRUCTURE OF PREVAILING MOTIONS

In this work we have calculated the average values of prevailing zonal U_0, meridional V_0 wind over the period 1986-1995. The parameters U_0, V_0 and their root-mean square deviations, caused by year-to-year variations are shown in Fig. 1. Over the height range 80 km to 110 km there is an increase in the northern wind from 2 ms^{-1} to 3 ms^{-1}. Zonal wind is to the west and it has a maximum value of about 7 ms^{-1} within the range of 95-98 km.

In the year-to-year variations of prevailing wind the quasi-biannual oscillations (QBO) is apparent (see Fig.2). In the period from May 1990 to June 1993 observations were not made. This break in the data is represented by a plane with zero level. The amplitude of QBO varies from 1 to 6 ms^{-1} with height and from year to year. Vertical phase velocity of QBO is equal to 3 km/month for both zonal and meridional wind, and is propagating downwards, corresponding to the upward propagation of QBO energy (Fahrutdinova *et al.*, 1997).